

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: NAKAZATO, Tokiya

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TITLE: AUTOMATIC IN SITU ELECTROPHORESIS METHOD AND APPARATUS

Amendment A: CLAIM AMENDMENTS

Claims 1 - 39 (canceled). These claims are canceled by the present amendment.

40. (New) A method of in situ electrophoresis of biological samples comprising:

preparing a sample plate and a gel plate, said sample plate being moved from a sample plate storage area, said gel plate being moved from a gel plate storage area in a direction opposite said sample plate to an application station;

applying reagent onto said gel plate;

moving an applicator to said sample plate so as to receive a sample onto said applicator;

moving said applicator toward said gel plate such that at least a portion of said sample on said applicator is loaded onto said gel plate, said sample plate being moved to a used sample plate storage area, the sample-loaded gel plate being moved an electrophoresis station adjacent said application station;

electrophoresing the sample-loaded gel plate, the electrophoresed gel plate being moved to a staining station adjacent said electrophoresis station;

staining the electrophoresed gel plate, the stained gel plate being moved to a scanning station adjacent said staining station; and

scanning the stained gel plate so as to electronically analyze a band in the gel of said gel plate, the scanned gel plate being moved to a gel plate disposal unit.

41. (New) The method of Claim 40, wherein said sample plate is in a removable stacked relationship with a plurality of sample plates in said sample plate storage area, said sample plate being moved from a bottom of said plurality of sample plates, and wherein said gel plate is in a removable stacked relationship with a plurality of gel plates in said gel plate storage area, said gel plate being moved from a bottom of said plurality of gel plates.

42. (New) The method of Claim 40, said step of applying said reagent comprising:

loading a plurality of reagents into a respective plurality of reagent reservoirs;

positioning a pipette in proximity to at least one of said plurality of reagent reservoirs, said pipette being a single pipette;

loading said pipette with said reagent;

transferring said reagent from said pipette onto said gel plate, said pipette being moved from said proximity to the reagent reservoirs to said gel plate at said application station; and

washing said pipette subsequent to the step of transferring the reagent from said pipette.

43. (New) The method of Claim 42, said step of washing comprising:

aligning said pipette with a water wash;

flushing an interior of said pipette with water;

rinsing an exterior of said pipette with water;

blotting a tip of said pipette so as to remove water therefrom; and

aspirating said interior of said pipette.

44. (New) The method of Claim 40, said step of preparing the sample plate comprising forming a plurality of sample wells on the sample plate, said step of moving said applicator into said sample plate comprising:

conveying said sample plate so as to be adjacent said gel plate; and

lowering said applicator into at least one of said plurality of sample wells on said sample plate such that the sample is adhesively secured to said applicator.

45. (New) The method of Claim 44, said applicator comprising a plurality of applicator elements, said plurality of applicator elements correspond respectively to said plurality of sample wells, said step of lowering comprising:

lowering said plurality of applicator elements into to said plurality of sample wells on said sample plate such that each of said plurality of applicator elements receives the sample from a separate sample well on said sample plate.

46. (New) The method of Claim 40, said step of moving said applicator to said gel plate comprising:

positioning said applicator above said gel plate;

lowering said applicator into the gel of said gel plate such that the portion of said sample is retained by the gel; and

lifting said applicator away from said gel plate.

47. (New) The method of Claim 40, said gel plate having electrodes formed thereon, said step of electrophoresing comprising:

conveying the sample-loaded gel plate to an electrophoresis device;

connecting said electrodes of said gel plate to a power source; and

applying an electrical field to said gel plate.

48. (New) The method of Claim 40, said step of staining comprising:

applying a staining reagent onto a surface of the electrophoresed gel plate.

49. (New) The method of Claim 48, said step of applying said staining reagent comprising:

loading a pipette with said staining reagent;

dispensing said staining reagent from the loaded pipette onto a roller; and

spreading the said staining reagent across the electrophoresed gel plate by moving said roller across the electrophoresed gel plate.

50. (New) The method of Claim 49, said pipette being a single pipette, said step of applying said staining reagent further comprising:

conveying the electrophoresed gel plate to a position below said pipette;

moving the loaded pipette to a position above said roller; and

positioning the staining reagent-dispensed roller over a staining window above the electrophoresed gel plate.

51. (New) The method of Claim 49, further comprising:

washing said roller subsequent to said step of spreading said staining reagent.

52. (New) The method of Claim 51, said step of washing said roller comprising:

moving said roller to a washing station having a water container;

lowering said roller into said water container;

rolling said roller so as to release the water therefrom; and

drying said roller.

53. (New) The method of Claim 40, further comprising:

drying the staining reagent gel plate prior to said step of scanning.

54. (New) The method of Claim 53, said step of drying comprising:

moving the stained gel plate to a drying station; and

oven drying the stained gel plate.

55. (New) The method of Claim 53, said step of drying comprising:

conveying the stained gel plate to a drying station; and

air drying the stained gel plate.

56. (New) The method of Claim 40, further comprising:

destaining the stained gel plate prior to said step of scanning.

57. (New) The method of Claim 56, said step of destaining comprising:

lowering one end of the stained gel plate such that the stained gel plate is tilted at an angle;

flowing water across a surface of the stained gel plate such that water flows from an elevated end of the stained plate toward the lower end of the stained gel plate; and

wiping the surface of said gel plate so as to remove the staining therefrom.

58. (New) The method of Claim 40, said step of scanning comprising:

measuring a location and an intensity and a resolution of the band so as to create a profile for sample identification; and

displaying the profile on a display screen.

59. (New) The method of Claim 40, wherein the scanned gel plate is in a removable stacked relationship with a plurality of used scanned gel plates in said gel plate disposal unit, the scanned gel plate being stacked from a bottom of said plurality of used scanned gel plates.

60. (New) An apparatus for in situ electrophoresis of biological samples comprising:

a housing;

a sample plate, being moved from a stacked relationship in a sample plate storage area to an application station and to a used sample plate storage area within said housing;

a gel plate, being moved from a stacked relationship in a gel plate storage area to gel plate disposal unit, said sample plate being moved parallel to said gel plate within said housing;

a reagent dispensing means positioned on said housing, said reagent dispensing means being cooperative with said gel plate for applying a reagent onto said gel plate at said application station;

an applicator means positioned on said housing and cooperative with said sample plate and with said gel plate for loading a sample from said sample plate onto said gel plate at said application station;

an electrophoresing means positioned in said housing for electrophoresing the sample-loaded gel plate at an electrophoresis station, said electrophoresis station being located adjacent said application station, the sample-loaded gel plate being moved laterally to said electrophoresis station from said application station;

a staining means positioned in said housing for staining the electrophoresed gel plate at a staining station, said electrophoresis station being located between said application station and said staining station, the electrophoresed gel plate being moved laterally to said staining station from said electrophoresis station; and

a scanning means cooperative with said housing for scanning the stained gel plate to electronically analyze a band in the gel of said gel plate at a scanning station, said staining station

being located between said electrophoresis station and said scanning station, the stained plate being moved laterally to said scanning station from said staining station, said gel plate disposal unit being located adjacent to said scanning station.

61. (New) The apparatus of Claim 60, said housing having a conveyer movably positioned thereon, said housing having a gantry supported thereon generally above said conveyer, said reagent dispensing means, said applicator means, and said staining means being connected to said gantry.

62. (New) The apparatus of Claim 60, said reagent dispensing means comprising:

a single pipette movably supported on said housing; and

a plurality of reagent reservoirs connected to said housing, said single pipette being movable so as to receive the reagent from at least one of said plurality of reagent reservoirs, said pipette being dispensable so as to release the reagent onto said gel plate.

63. (New) The apparatus of Claim 62, further comprising:

a washing means positioned on said housing and cooperative with said pipette, said washing means for applying washing water into an interior of said pipette and over an exterior of said pipette; and

an aspirating means positioned on said housing and cooperative with said pipette for aspirating the interior of said pipette to remove the water therefrom.

64. (New) The apparatus of Claim 60, said applicator means comprising:

an applicator having a plurality of applicator elements thereon, said applicator being movably positioned on said housing so as to lower said plurality of applicator elements into a corresponding plurality of sample wells formed in said sample plate, said applicator being movable so as to lift said plurality of applicator elements from said plurality of sample of wells.

65. (New) The apparatus of Claim 60, said gel plate having electrodes formed thereon, said electrophoresing meaning comprising:

a power means positioned on said housing, said electrodes of said gel plate being selectively connectable to said power means for applying an electrical field to said gel plate.

66. (New) The apparatus of Claim 60, said staining means comprising:

a pipette movably positioned on said housing;

a staining reagent reservoir cooperative with said pipette so as to allow said pipette to be selectively loaded with a staining reagent;

a roller movably positioned on said housing so as to be selectively positionable below said pipette and rollable over said gel plate; and

a washing means positioned on said housing, said washing means for removing the staining reagent from said roller.

67. (New) The apparatus of Claim 66, said washing means comprising:

a water container having a water bath therein, said roller being movable so as to submerge within said water bath.

68. (New) The apparatus of Claim 60, further comprising:

a drying means positioned on said housing, said drying means for drying the stained gel plate.

69. (New) The apparatus of Claim 68, said drying means being an oven dryer.

70. (New) The apparatus of Claim 68, said drying means being an air dryer.

71. (New) The apparatus of Claim 60, further comprising:

a destaining means positioned on said housing for removing stain from said gel plate.



72. (New) The apparatus of Claim 71, said destaining means comprising:

an actuator means positioned on said housing for lowering an edge of the gel plate;

and

a water supply means positioned adjacent said actuator means for flowing water across a surface of said gel plate so as to remove the stain therefrom.

73. (New) The apparatus of Claim 60, further comprising:

a stacking means positioned at an end of said housing for stacking the gel plate subsequent to scanning by said scanning means.